



## POWER SUPPLY TECHNICAL PROCEDURES

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## Power Supply Technical Procedures

### Section 1

#### Power Supply Switch Replacement for Apple ][

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## INTRODUCTION

**NOTE:** These procedures are for gold-case power supplies only. Do not attempt to repair silver-case power supplies; replace them with gold-case power supplies.

If an Apple ][ cannot be turned on (or off), the most probable cause is a power supply problem. You can test this by substituting a known-good power supply in the customer's Apple ][; if the problem disappears, you have isolated it to the customer's power supply.

The most common cause of power supply problems is the switch. If the switch cannot be moved, or if it offers no resistance to movement, the switch is probably causing the problem. While you are replacing the switch, you can also check the fuse. The switch and fuse are the only Level 1 replaceable components.

For a summary of the procedures, see p. 1.15.

**WARNING:** Power supplies store dangerous high voltages and should always be disconnected before being serviced. Even after they are disconnected, power supplies may hold a dangerous voltage. **ALWAYS EXERCISE CAUTION IN REPAIRING POWER SUPPLIES: NEVER PROBE INSIDE A POWER SUPPLY UNNECESSARILY.**

**NOTE:** This repair is optional at Level 1. With the reduction in the price of the power supply exchange module, it may be more economical, depending upon your equipment and experience, to swap out defective power supplies.

Older model silver-case power supplies lack self-discharging circuits and should not be repaired in any case; always exchange them for gold-case supplies.

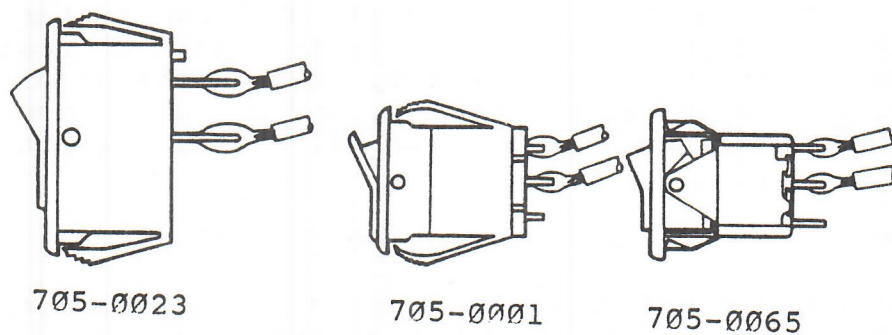


FIGURE 1





## REQUIREMENTS

### A. Tools:

1. Soldering iron (25 watt) and 63/37 rosin-core solder
2. Needlenose pliers
3. X-acto knife
4. Four-inch diagonal cutters ("dikes")
5. Heat gun
6. Wire stripper (preferably automatic)
7. Pencil eraser
8. Hemostats
9. Portable power drill, with approx. 13/64 inch (.2" or 5mm) diameter bit
10. Vise large enough to hold power supply
11. Safety goggles
12. 1/8 inch center punch or 16-penny nail
13. Hammer
14. Small or medium Phillips screwdriver
15. Small flatblade screwdriver
16. Insulated fuse-puller or equivalent

### B. Replacement material and components:

Fuse (Apple Part Number U740-0001)

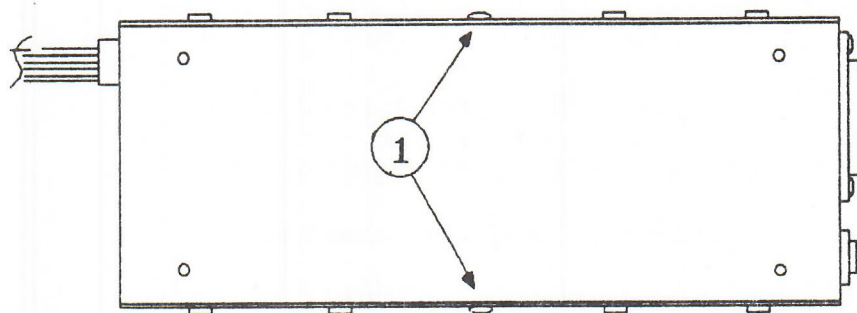
For power supplies with a large, two-terminal switch,

1. Switch (P/N 705-0023)
2. Shrink tubing, 1/4 inch internal diameter

For those with small, three-terminal switch,

1. Switch (P/N 705-0065)
2. Shrink tubing, 1/8 inch internal diameter

(See Figure 1 for the three types of switch usually found in Apple ][ power supplies. The small, three-pole 705-0001 (now obsolete) should be replaced with a 705-0065. The large, two-pole 705-0023 must be replaced by another 705-0023.)



**Figure 2**  
*Bottom View of Power Supply*





## PROCEDURES

0. **BEFORE YOU DO ANYTHING ELSE**, take two 3/4 inch pieces of shrink tubing (1/8 inch internal diameter if working with small switch, 1/4 inch i.d. for large switch), and place or tape them onto the new switch, so that you won't forget to install them before soldering the new switch to the power supply leads.

### 1. REMOVE THE POWER SUPPLY FROM THE APPLE

- a. Power off the Apple ][ and disconnect the power cord from the power supply.
- b. Unplug the power supply from the motherboard.
- c. Unscrew the power supply from the Apple ][ baseplate and carefully remove it from the Apple.

### 2. REMOVE THE COVER (BOTTOM PLATE) FROM THE POWER SUPPLY

**NOTE:** Some technicians prefer to pry the switch out of the case without removing the cover. If the switch is obviously bad and you choose not to open the case, go directly to step 3.

- a. Locate the two rivets that hold the bottom plate onto the power supply (Figure 2, #1).
- b. Clamp the power supply down firmly in the vise, so that one of the rivetted sides is facing up.
- c. Insert the 13/64 inch bit into the drill chuck and secure it. Put on safety goggles to protect your eyes from metal shavings.
- d. Position the drill bit in the center of the rivet, making sure the drill is aimed straight down into the rivet head. Holding it firmly so that it doesn't slip off the rivet, turn it on at a low speed and drill until the head of the rivet comes off. Do not drill all the way through the rivet or enlarge the hole in the case. Be careful not to scratch the case.

**NOTE:** If the rivet is loose and turns with the drill, place the center punch in the hole in the rivet head and hit it with the hammer. This will spread the rivet head so that it grips the sides of its hole.

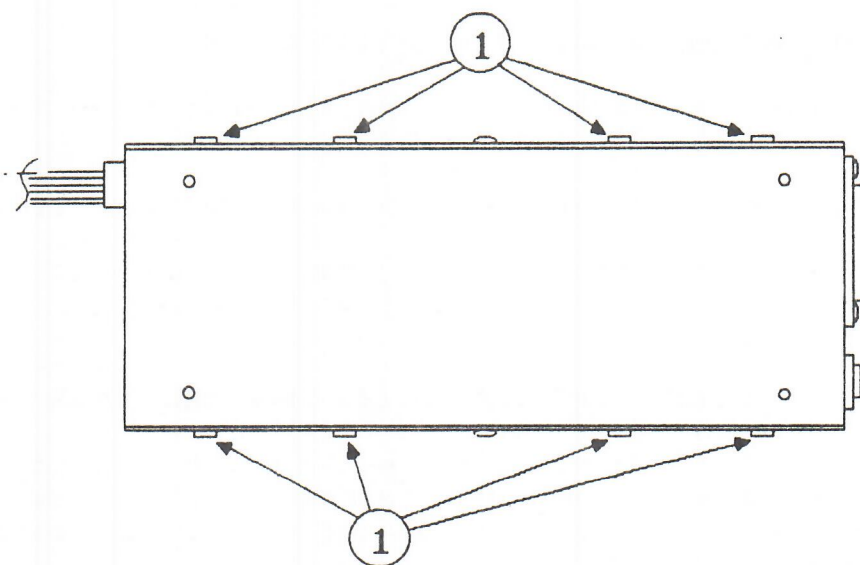


Figure 3

- e. Hold the center punch on the rivet and hit it with the hammer until the rivet falls through into the case.
- f. Repeat steps d and e for the rivet on the opposite side of the case. Remove the power supply from the vise.
- g. Remove the eight screws (four on each side) that hold the bottom plate on (Figure 3, #1).
- h. Pry up the bottom plate and set it aside. Be careful not to scratch the case.
- i. Turn the power supply over and shake it to remove the rivet fragments. **MAKE SURE YOU FIND BOTH RIVETS.** If you can't find them, loosen (but do not remove) the screws that hold the p.c. board in place and shake until the rivets come out, but to avoid possible shock hazard, NEVER USE YOUR FINGERS TO PROBE INSIDE THE POWER SUPPLY; shake the rivets out of the case.

If you loosen the PCB screws, be sure to retighten them afterwards.

- j. Check the fuse (located near the switch and the power cord plug; usually marked F1 on the p.c. board). If it has blown, use an insulated fuse puller, machinist's scribe or other **INSULATED** tool to pry up one end; then you can remove it with your fingers. (Handle it by its metal ends.) Replace it with another fuse (Apple P/N U740-0001) and test the power supply on a known-good system. If the second fuse blows also, do not attempt further repair. Replace the power supply with an exchange module and send the defective power supply back to Apple.

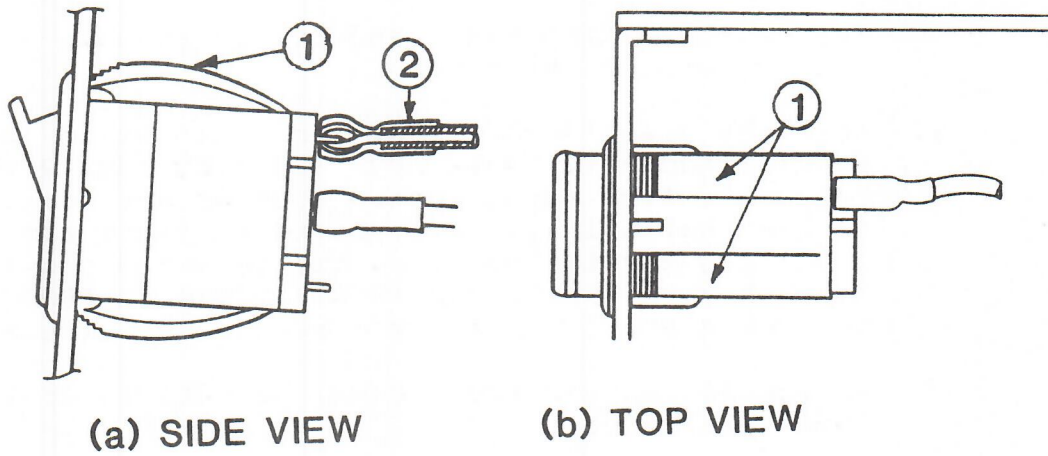


FIGURE 4



### 3. REMOVE THE OLD SWITCH

- a. If you have removed the cover, clip off the two locking tabs (Figure 4, #1) on top of the switch (use diagonal cutters); then push the switch out with your fingers. (If that doesn't work, push the lower locking tabs out of the way with a screwdriver and try pushing again.)

If you left the cover on, pry the switch out of the case (use screwdriver, assisted by needlenose pliers). Take care not to scratch the case.

- b. Strip the shrink tubing (Figure 4a, #2) off the leads (i.e., wires) (use X-acto knife), taking care not to damage the insulation on the leads.
- c. De-solder the leads from the switch terminals and discard the switch. (To de-solder, tin the soldering iron [i.e., put a drop of fresh solder on it] and heat the solder joint, while tugging on the switch with your free hand. When the solder melts, pull the lead free.)

**HINT:** The leads are very short. If you are working with the cover on, a pair of hemostats, loosely clamped onto the leads, can simplify your job by keeping the leads steady and preventing them from falling back into the case.

### 4. CLEAN AND PREPARE THE LEADS

- a. Clean excess solder from the leads (use soldering iron: either tap it off or draw it off onto the iron).

**NOTE:** IF THE LEADS ARE VERY SHORT AND AWKWARD TO WORK WITH, REMOVE THE COVER FROM THE POWER SUPPLY, AS IN STEP 2 ABOVE. IF THEY ARE TOO SHORT TO CONNECT TO THE NEW SWITCH, REPLACE THE POWER SUPPLY.

- b. Clip off any badly frayed part of the ends of the leads. (Cut off no more than necessary to create a neat end.)
- c. Strip wires to obtain 1/4 inch of stripped wire on each lead. Twist ends to prevent fraying.
- d. Tin the end of each lead.

FIGURE 5

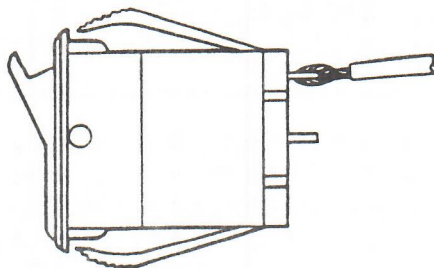


FIGURE 6

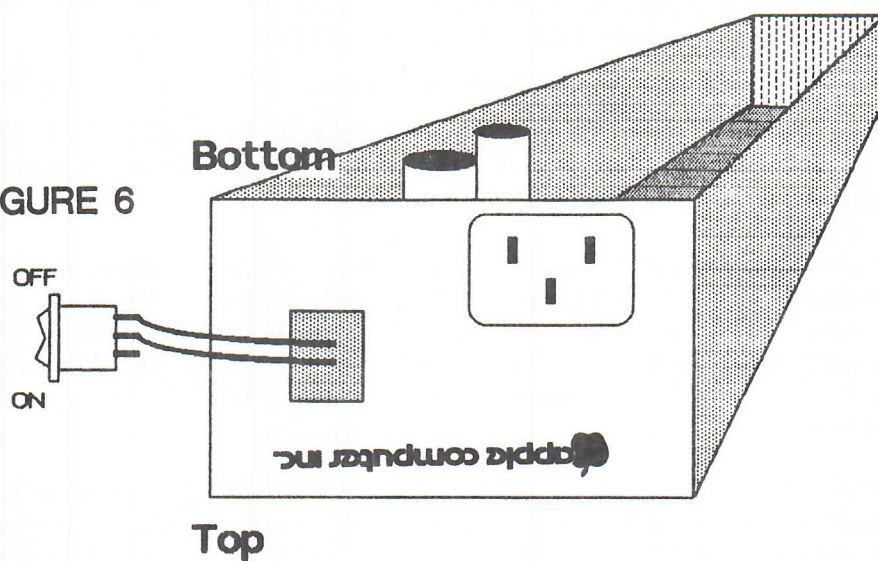
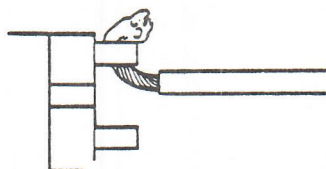
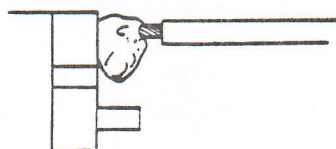


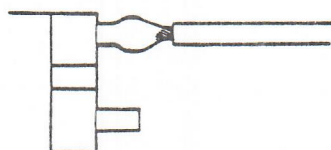
FIGURE 7



TOO LITTLE SOLDER ,  
POOR MECHANICAL CONNECTION



TOO MUCH SOLDER



GOOD





- e. Slip a one-inch piece of heat-shrink tubing on each lead, and slide it back as far as possible (to prevent heat damage while you are soldering).
- f. Shape the end of each lead so that it will fit through the terminal of the new switch (use needlenose pliers).

## 5. INSTALL THE NEW SWITCH

- a. **THREE-TERMINAL SWITCH:** Thread either lead through the hole in either outside terminal and crimp it with the pliers, so that the lead forms a loop around the end of the terminal (Figure 5). Attach the other lead to the middle terminal in the same way.

-- The open terminal will now mark the "ON" side. Orient it toward the top of the case. (See Figure 6. If you are working with the cover off, the case will be upside down.)

**TWO-TERMINAL SWITCH:** Clean the terminals of the switch with an eraser; then tin them. Then thread one lead through each terminal and crimp it with pliers, to form a loop around the end of the terminal as in Figure 5.

-- Make sure that "ON" (marked on the switch) is toward the top of the case. (If you are working with the cover off, the case will be upside down: see Figure 6.)

- b. Solder the leads to the terminals. To avoid damaging the switch, do not apply the soldering iron to the switch for more than 20 seconds.
- c. Check your solder joints. (See Figure 7 for examples of good and bad solder joints.)
- d. After the solder has cooled, slip the shrink tubing down both leads, making sure that it covers both terminals completely and overlaps the insulation on the leads. Heat the tubing with the heat gun until it has shrunk to a tight covering around each terminal and lead.



- e. Make sure the "ON" side of the switch (the open terminal of the three-terminal switch) is toward the top of the case, and push the switch into its slot in the case until it seats itself firmly. (See Figure 8.)

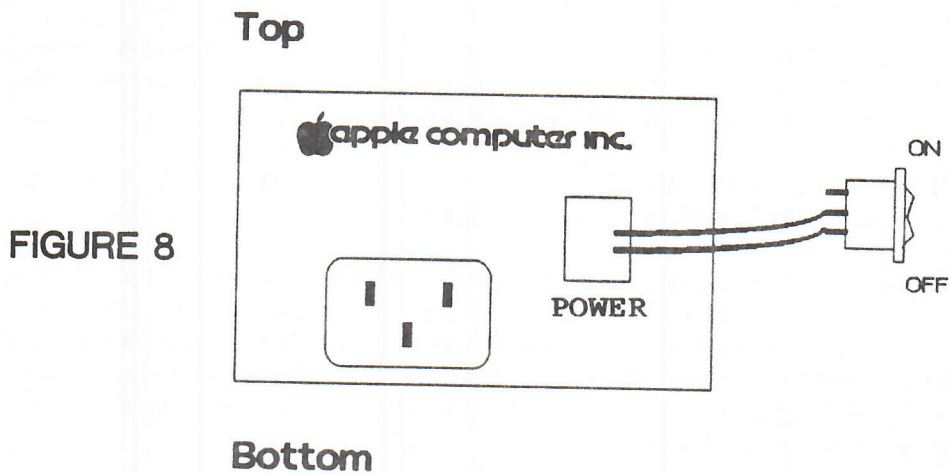
## 6. REPLACE THE COVER

- a. If you removed the cover, turn over the power supply and shake it to remove loose objects, metal shavings, etc. Inspect visually for excess solder droplets, etc., and remove any you find. (A brush, vacuum or air gun might be helpful.)
- b. Replace the cover and fasten it with the eight screws. DO NOT REPLACE THE RIVETS.

## 7. TEST THE REPAIR

- a. Plug the repaired power supply into the motherboard of a known-good Apple ][ (NOT the customer's).
- b. Make sure the power supply switch is set to "OFF". Connect the power cord to the power supply, then to the wall.
- c. Turn on the power supply. If the power light goes on and the Apple tries to boot, the repair was successful. Replace the power supply in the customer's Apple and return the system to the customer.

If the repair was not successful, swap power supplies for the customer and send the customer's power supply to Regional Service Center.



## CHECKLIST

Use this checklist as an on-the-job reminder. For detailed explanations of any steps, refer to the procedures on the preceding pages.

1. Equipment ready?
  - a. Switch
  - b. Medium flatblade screwdriver
  - c. Needlenose pliers
  - d. X-acto knife
  - e. Four-inch diagonal cutters ("dikes")
  - f. Heat gun
  - g. Shrink tubing
  - h. Wire stripper (preferably automatic)
  - i. Soldering iron (25 watt) and 63/37 rosin-core solder
  - j. Hemostats
  - k. Small or medium Phillips screwdriver
  - l. Drill with 13/64 inch (5mm) bit
  - m. Safety goggles
  - n. Center punch or 16-penny nail
  - o. Hammer
  - p. Eraser
  - q. Fuse-pulling tool (insulated)
  - r. Fuse
2. Remove power supply.
3. Open case and check fuse. (Optional)
4. Pry out switch.
5. De-solder and prepare leads.
6. Put shrink tubing on leads.
7. Solder leads to new switch. (See Figure 8 for orientation of 3-pole switch.)
8. Position shrink tubing over solder joints and apply heat.
9. Pop switch in.
10. Shake out case (if open).
11. Replace cover; do not replace rivets.
12. Test on Apple ][ (NOT THE CUSTOMER'S).

